

What is claimed is:

1. An inner-force providing input device comprising:

an operating member to be manually rotated;

5 a power-operated actuator for providing a torque to the operating member;

rotation angle detecting means for detecting a rotation angle of the operating member;

operating velocity detecting means for detecting an angular velocity of the operating member; and

10 control means for controlling the power-operated actuator depending upon an rotation angle detected by the rotation angle detecting means and an angular velocity detected by the operating velocity detecting means;

the control means being set such that, while the operating member rotates from a predetermined first angle to a predetermined third angle beyond a predetermined second angle, when the operating member is within a range of from the first angle to the second angle, a torque in a same direction as a rotating direction of the operating member is provided from the power-operated actuator to the operating member and decreased with an increase in rotation angle of the operating member,

20 when the operating member reaches the second angle, a torque product based on an angular velocity of the operating member detected by the operating velocity detecting means is provided from the power-operated actuator to the operating member, and

when the operating member is within a range of from the second angle to the third angle, a torque in a reverse direction

to a rotating direction of the operating member is provided from the power-operated actuator to the operating member and increased with an increase in rotation angle of the operating member.

2. An inner-force providing input device according to claim
5 1, wherein the operating velocity detecting means comprises the rotation angle detecting means and an operating velocity arithmetic operating section for arithmetically operating an angular velocity of the operating member on the basis of a rotation angle change of the operating member detected by the rotation
10 angle detecting means, the operating velocity arithmetic operating section being included in the control means.

3. An inner-force providing input device according to claim
2, wherein the control means includes a torque product arithmetic operating section for arithmetically operating the torque product
15 according to a product of the angular velocity arithmetically operated by the operation velocity arithmetic-operating section and a preset proportional multiplier, to adjustably configure an upper limit value of torque of upon providing the torque product to the operating member and the proportional multiplier.

20 4. An inner-force providing input device comprising:
an operating member to be manually operated straight-line;
a power-operated actuator for providing a force to the operating member;

position detecting means for detecting a position of the
25 operating member;

operating velocity detecting means for detecting a moving velocity of the operating member; and

control means for controlling the power-operated actuator depending upon a position detected by the position detecting means and a moving velocity detected by the operating velocity detecting means;

5 the control means being set such that, while the operating member moves from a predetermined first position to a predetermined third position beyond a predetermined second position, when the operating member is within a range of from the first position to the second position, a force in a same direction
10 as a moving direction of the operating member is provided from the power-operated actuator to the operating member and decreased with an increase in moving distance of the operating member,
 when the operating member reaches the second position, an impulse based on a moving velocity of the operating member
15 detected by the operating velocity detecting means is provided from the power-operated actuator to the operating member, and
 when the operating member is within a range of from the second position to the third position, a force in a reverse direction to a moving direction of the operating member is
20 provided from the power-operated actuator to the operating member and increased with an increase in moving distance of the operating member.